1. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 120° *C and is placed into a* 12° *C bath to cool. After 22 minutes, the uranium has cooled to* 61° *C.*

   A. $k = -0.03592$

   B. $k = -0.04071$

   C. $k = -0.03113$

   D. $k = -0.03057$

   E. None of the above

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2. A town has an initial population of 60000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	59964	59924	59884	59844	59804	59764	59724	59684	59644

   A. Exponential

   B. Logarithmic

   C. Linear

   D. Non-Linear Power

   E. None of the above

---

3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 180° *C and is placed into a* 11° *C bath to cool. After 14 minutes, the uranium has cooled to* 110° *C.*

A. $k = -0.09660$

B. $k = -0.04270$

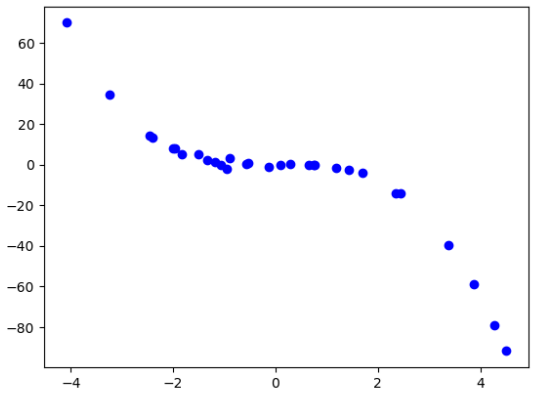
C. $k = -0.05354$

D. $k = -0.05300$

E. None of the above

---

4. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

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5. Using the scenario below, model the population of bacteria α in terms

of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 2 hours, the petri dish has 704 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 25 minutes

B. About 14 minutes

C. About 152 minutes

D. About 85 minutes

E. None of the above

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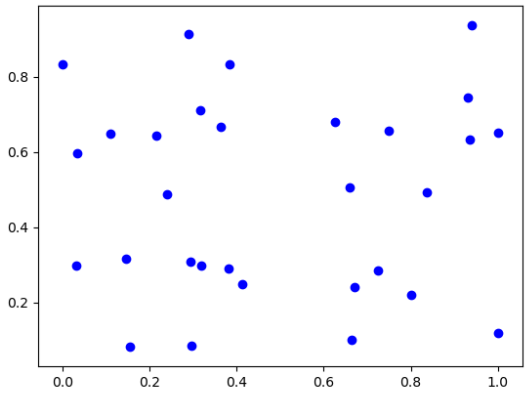
6. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Logarithmic model

D. Exponential model

E. None of the above

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7. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 551 grams of element X and after 3 years there is 91 grams remaining.

   A. About 1095 days

   B. About 365 days

   C. About 365 days

   D. About 1 day

   E. None of the above

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8. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 740 grams of element X and after 9 years there is 82 grams remaining.

   A. About 1 day

   B. About 4380 days

   C. About 1460 days

   D. About 730 days

   E. None of the above

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9. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 877 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 285 minutes

B. About 131 minutes

C. About 21 minutes

D. About 47 minutes

E. None of the above

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10. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89940	89880	89760	89520	89040	88080	86160	82320	74640

A. Exponential

B. Linear

C. Non-Linear Power

D. Logarithmic

E. None of the above
